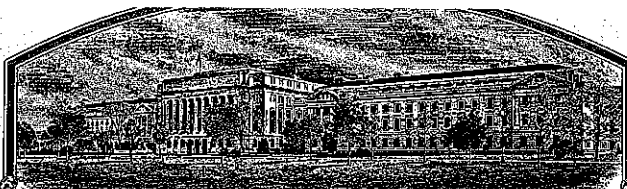


No.

9500075



# THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

USDA - Agricultural Research Service &  
Utah Agricultural Experiment Station

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF EIGHTEEN YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN THE UNITED STATES SEED OF THE VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED AND (2) SHALL CONTAIN THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, U.S.C. 2321 ET SEQ.)

WHEATGRASS, SIBERIAN CRESTED

'Vavilov'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this fourteenth day of June, in the year of our Lord two thousand one.

Attest:

*Alvin K. Post*

Acting Commissioner  
Plant Variety Protection Office  
Agricultural Marketing Service

*W. E. Carson*

Secretary of Agriculture

U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE  
SCIENCE DIVISION

## APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(INSTRUCTIONS ON REVERSE)

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) (as it is to appear on the Certificate) <u>UTAH Agricultural Experiment Station</u> USDA-Agricultural Research Service		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NO. Siberian Crested Wheatgrass		3. VARIETY NAME Vavilov	
4. ADDRESS (street and no. or R.F.D. no., city, state, and ZIP) USDA-ARS-Forage and Range Research Utah State University Logan, UT 84322-6300		5. PHONE (include area code) 801-797-3069		FOR OFFICIAL USE ONLY PVPO NUMBER <u>9500075</u>	
6. GENUS AND SPECIES NAME <u>Agropyron fragile</u>		7. FAMILY NAME (Botanical) Poaceae		Filing and Examination Fee: \$ <u>2,325.00</u> Date <u>Jan. 12, 1995</u> Certificate Fee: \$ <u>320.00/100</u> Date <u>3/12/01</u>	
8. CROP KIND NAME (Common Name) Siberian Crested Wheatgrass		9. DATE OF DETERMINATION <u>July 15, 1991</u> <i>per letter of 2-23-96</i> <u>1 July 1994</u> <i>MH 1-6-99</i>		Filing and Examination Fee: \$ <u>2,325.00</u> Date <u>Jan. 12, 1995</u> Certificate Fee: \$ <u>320.00/100</u> Date <u>3/12/01</u>	
10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION (Corporation, partnership, association, etc.) U.S. Government		11. IF INCORPORATED, GIVE STATE OF INCORPORATION N/A		12. DATE OF INCORPORATION N/A	
13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS K. H. Asay USDA-ARS, Forage and Range Research Laboratory Utah State University Logan, UT 84322-6300					

PHONE (include area code): 801-797-3069

14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow INSTRUCTIONS on reverse)	
a. <input checked="" type="checkbox"/> Exhibit A, Origin and Breeding History of the Variety b. <input checked="" type="checkbox"/> Exhibit B, Novelty Statement c. <input checked="" type="checkbox"/> Exhibit C, Objective Description of Variety d. <input type="checkbox"/> Exhibit D, Additional Description of Variety e. <input checked="" type="checkbox"/> Exhibit E, Statement of the Basis of Applicant's Ownership f. <input checked="" type="checkbox"/> Seed Sample (2,500 viable untreated seeds). Date Seed Sample mailed to Plant Variety Protection Office _____ g. <input checked="" type="checkbox"/> Filing and Examination Fee (\$2,325) made payable to "Treasurer of the United States"	
15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? (See section 83(a) of the Plant Variety Protection Act) <input checked="" type="checkbox"/> YES (If "YES," answer items 16 and 17 below) <input type="checkbox"/> NO (If "NO," skip to item 18 below)	
16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED? <input checked="" type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input checked="" type="checkbox"/> CERTIFIED
18. DID THE APPLICANT(S) PREVIOUSLY FILE FOR PROTECTION OF THE VARIETY IN THE U.S. <input type="checkbox"/> YES (If "YES," through <input type="checkbox"/> Plant Variety Protection Act <input type="checkbox"/> Patent Act. Give date: _____). <input checked="" type="checkbox"/> NO	
19. HAS THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETING IN THE U.S. OR OTHER COUNTRIES? <input checked="" type="checkbox"/> YES (If "YES," GIVE NAMES OF COUNTRIES AND DATES) <u>The variety was released 1 July 1994 and foundation seed was planted in 1994 for initial production of certified seed in 1995.</u> <input type="checkbox"/> NO	
20. The applicant(s) declare(s) that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.	
The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in section 41, and is entitled to protection under the provisions of section 42 of the Plant Variety Protection Act.	
Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.	

SIGNATURE OF APPLICANT [Owner(s)]

CAPACITY OR TITLE  
Administrator, USDA  
Agricultural Research  
Service

DATE

JAN 30 1995

SIGNATURE OF APPLICANT [Owner(s)]

CAPACITY OR TITLE

DATE

EXHIBIT A

GENEALOGICAL AND BREEDING PROCEDURE DESCRIPTION

FOR

'VAVILOV' SIBERIAN CRESTED WHEATGRASS

Vavilov Siberian crested wheatgrass [*Agropyron fragile* (Roth) Candargy] was derived from accessions originally received from N.I. Vavilov Institute of Plant Industry, St. Petersburg, Russia (VIR); Stavropol Botanical Garden, Stavropol, Russia; Eskisehir Plant Breeding Station, Eskisehir, Turkey; and selections from the variety P-27. Selections from the variety 'P-27' constituted approximately 10% of the parental germplasm. The original accessions were selected from a genetically broad-based population on the basis of green-color retention and vegetative vigor during the late summer under extreme drought conditions on a range site in Box Elder County, Utah. During the development of the cultivar, the breeding population was screened for three cycles for vegetative vigor, response to drought, resistance to diseases and insects, seedling vigor (emergence from deep seedings), seed yield, and plant type. Open-pollinated progenies from 14 selected clonal lines in the third breeding cycle were bulked to form Breeder seed. The breeding population has remained stable for all observed characteristics, including spike length and width, stand-establishment vigor, forage and seed yield potential, and plant height for three generations. Phenotypic variation within the variety is typical of that expected in a cross-pollinating species. Approximately 10% of the parental germplasm was derived from an accession with a slightly wider spike than the other parental accessions. This has led to consistent and stable variation within the variety for spike width. Mean values for several characters and standard deviations associated with those means

are presented in Table 1. As indicated by the standard deviations, some variation occurs for the characteristics evaluated; however, this variation is not substantially different from that observed in the check varieties, P-27 and Nordan. Other than the variation documented in Table1, no variants have been observed in Vavilov and no off types have been observed.

Breeder, Foundation, and Certified seed classes will be recognized. Breeder seed will be maintained by the USDA-ARS Forage and Range Research Laboratory at Logan, UT. Foundation seed will be produced by the USDA-ARS at Logan and distributed to seed growers by the Utah Crop Improvement Association. Certified seed will be produced from Foundation seed, and seed will be sold only as a class of certified seed.

26 FEB 55

08/1

## EXHIBIT B

## DESCRIPTION AND NOVELTY STATEMENT

## 'VAVILOV' SIBERIAN CRESTED WHEATGRASS

*Agropyron fragile* (Roth) Candargy

The Siberian crested wheatgrass cultivar, Vavilov, was developed from a unique source of germplasm obtained from collections originally made in the former USSR and Turkey. The original parental plant materials demonstrated exceptional color retention and resistance to drought stress under arid range conditions in northwest Utah. A breeding program was subsequently conducted with this germplasm pool to make additional improvements in its resistance to biotic and abiotic stresses and other important agronomic characteristics.

The Siberian crested wheatgrass (*Agropyron fragile*) is more drought-resistant than other crested wheatgrasses (*Agropyron cristatum* and *A. desertorum*), and it is better adapted to sandy soils than other crested wheatgrasses. In the natural habitats for the crested wheatgrass complex in Asia, Siberian (*A. fragile*) occupies the dry areas, Standard (*A. desertorum*) the intermediate areas, and Fairway (*A. cristatum*) the more favorable sites in terms of available water in the soil. Also, Siberian crested wheatgrass can clearly be distinguished from all other crested wheatgrasses on the basis of spike characteristics. Siberian has longer and narrower spikes than all other crested wheatgrasses. This is the major morphological character separating Siberian from the other species in taxonomic keys. Differences in spike length and width is documented in Table 1. Both Vavilov and P-27 have longer and narrower spikes than the Standard type cultivar, Nordan. Although the Fairway type was not included in this trial, varieties within this type have shorter spikes than Standard (See page from reprint, Asay et al., 1992).

4

Seedset of the AD  $\times$  MCA-CO hybrids was equivalent to MCA and less than AD. Stainable pollen in two of the AD  $\times$  MCA hybrids was significantly greater than AD.

#### Cytological Analysis

Somatic chromosome numbers of the 47 AD  $\times$  MCA-CO hybrid plants included in the cytological studies ranged from  $2n=27$  to  $2n=32$  (Table 3). More than half the plants were euploid ( $2n=28$ ), and all but three of the aneuploid plants had ploidy levels greater than  $2n=28$ . Substantial variation occurred among the hybrid progenies in chromosome configurations observed at metaphase I. Reciprocal differences were also evident. For example, the AD-1  $\times$  MCA-2 (Fig. 1A) progenies have considerably fewer univalents, trivalents, and higher order multivalents ( $>IV$ ) than their reciprocal counterparts (Fig. 1B,C). The *A. desertorum* cytoplasm was apparently more compatible with the genetic complement from the three parental

species than that present in the *A. cristatum*  $\times$  *A. mongolicum* amphiploid.

The hybrid progenies (Fig. 1D,E) had fewer rod bivalents, about the same number of ring bivalents and fewer total bivalents than *A. desertorum* (Fig. 1F). In addition, the hybrid progenies had more chromosomes associated in trivalents, quadrivalents, and higher-order multivalents, which is indicative of heterozygosity for translocations.

In spite of these differences, meiotic relationships in the hybrid plants are more or less typical of that expected in an autotetraploid. These data along with C values ranging from 0.74 to 0.86 (Table 3) strongly suggest that, although some structural differentiation has occurred, genomes in *A. cristatum*, *A. mongolicum*, and *A. desertorum* are essentially homologous.

#### Multivariate Analysis

Seven of the 31 morphological characters originally included in the multivariate analysis

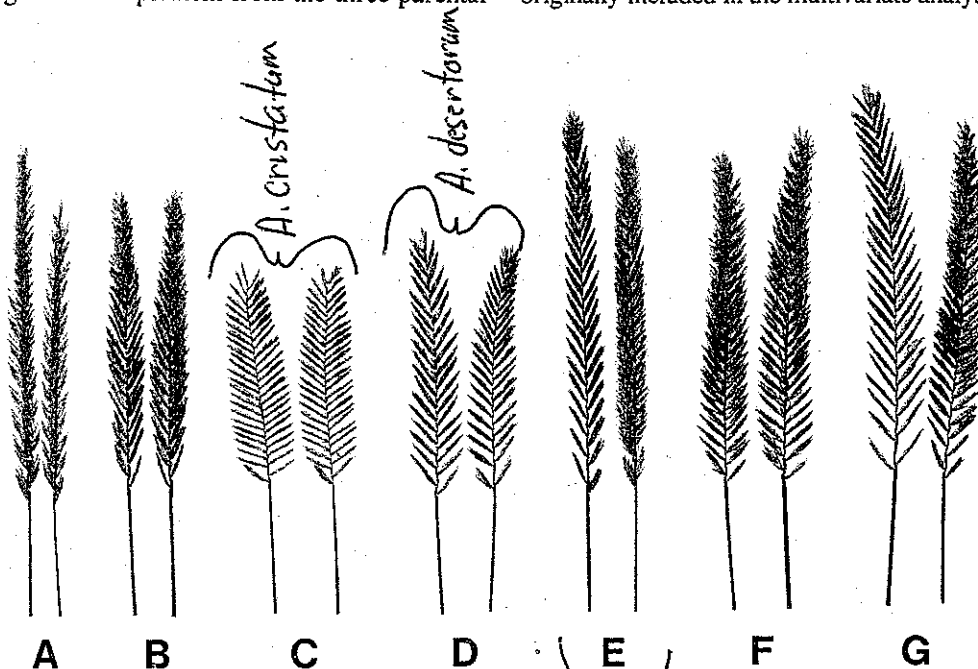


Fig. 2. Spikes of (A) *A. mongolicum*, (B)  $F_1$  hybrids between *A. mongolicum* and *A. cristatum*, (C) *A. cristatum*, (D) *A. desertorum*, (E) *A. fragile*, (F) the amphiploid of *A. mongolicum* and *A. cristatum*, and (G) amphiploid  $\times$  *A. desertorum*.

*A. fragile*

Prior to the release of 'Vavilov', only one other variety of the Siberian crested wheatgrass had been released. This variety, 'P-27', was released in 1953 by the USDA-SCS and Idaho Agricultural Experiment Station. In extensive evaluation trials, Vavilov has demonstrated significantly better seedling vigor and productivity under drought conditions than P-27. Table 2 shows the stand-establishment ratings of Vavilov compared with P-27 and other crested wheatgrass varieties on a dry sandy site in southern Idaho. Because of the extremely dry conditions during the first two years of the study, it was not possible to take dry matter yields; however, stand ratings were made. Vavilov had significantly better stand establishment than P-27 during all four years and produced significantly more forage than P-27 during the two years that forage yields were determined. These differences are also apparent on a relatively harsh, sandy slope near Logan, Utah (Table 4). On much more favorable sites in NW Utah and central Wyoming (Tables 3 and 5), Vavilov had significantly better stand establishment but forage yields were not always significantly different. In an evaluation of plants spaced on 1 m centers on a moderately favorable site in central Utah (Table 6), Vavilov was significantly more robust than P-27 as indicated by the two-year averages in forage yield. Seed yields were similar for the two varieties; however, Vavilov had larger seeds.

In summary, Siberian crested wheatgrass is distinguished from all other crested wheatgrasses on the basis of spike type. Vavilov and P-27 are the only two varieties of Siberian wheatgrass to be released. We have demonstrated that Vavilov is clearly superior to P-27 on the basis of stand establishment and forage production on dry sandy sites. It establishes faster than P-27 on more favorable sites but after both varieties are established, forage yields are often not significantly different. Other crested wheatgrass varieties, such as

CD-II and Hycrest would be recommended on more favorable sites (heavier soils and more precipitation) instead of either of the Siberian varieties, Vavilov or P-27.

Vavilov is a tetraploid ( $2n=28$ ) and is fully interfertile with other tetraploid cultivars of crested wheatgrass as well as the hybrid cultivar Hycrest. Cytological studies show that Siberian crested wheatgrass shares the same genome ('P') with other diploid ( $2n=14$ ), tetraploid, and hexaploid ( $2n=42$ ) forms of the crested wheatgrass complex.



U.S. DEPARTMENT OF AGRICULTURE  
EXHIBIT C  
AGRICULTURAL MARKETING SERVICE  
SCIENCE & TECHNOLOGY  
PLANT VARIETY PROTECTION OFFICE  
BELTSVILLE, MARYLAND 20705

OBJECTIVE DESCRIPTION OF VARIETY  
WHEATGRASS

NAME OF APPLICANT(S) <u>K. H. Asay</u>	FOR OFFICIAL USE ONLY
ADDRESS (Street and No. or R.F.D. No., City, State, and Zip Code) <u>USDA-ARS</u> <u>Utah State University</u> <u>Logan, Utah 84322-6300</u>	PVPO NUMBER <u>9500075</u>
	VARIETY NAME <u>Vavilov</u>
	TEMPORARY OR EXPERIMENTAL DESIGNATION

PLEASE READ ALL INSTRUCTIONS CAREFULLY: Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (e.g.    or   ) when number is either 99 or less or 9 or less respectively. Data for quantitative plant characters should be based on a minimum of 25 plants. Comparative data should be determined from varieties entered in the same trial. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designate system used: \_\_\_\_\_

Please answer all questions for your variety; lack of response may delay progress of your application.

1. SPECIES:

☒

Common  
and  
Scientific  
Name:

- 1 = Fairway Crested Wheatgrass (*Agropyron cristatum*)
- 2 = Standard Crested Wheatgrass (*Agropyron desertorum*)
- 3 = Siberian Wheatgrass (*Agropyron fragile* spp. *sibiricum*)
- 4 = Streambank Wheatgrass (*Elymus lanceolatus* ssp. *lanceolatus*)
- 5 = Slender Wheatgrass (*Elymus trachycaulus*)
- 6 = Tall Wheatgrass (*Elytrigia elongata*)
- 7 = Intermediate Pubescent Wheatgrass (*Elytrigia intermedia* ssp. *intermedia*)
- 8 = ~~\_\_\_\_\_~~
- 9 = Thickspike Wheatgrass
- 10 = Western Wheatgrass (*Pascopyrum smithii*)
- 11 = Beardless Wheatgrass (*Pseudoroegneria spicata* ssp. *inermis*)
- 12 = Bluebunch Wheatgrass (*Pseudoroegneria spicata* ssp. *spicata*)
- 13 = Other = \_\_\_\_\_

☐

Interspecific  
Hybrid:

- 1 = *Agropyron cristatum* x *desertorum* = Crested Wheatgrass
- 2 = *Elytrigia repens* ssp. *repens* x *Pseudoroegneria spicata* = RS Wheatgrass
- 3 = *Pseudoroegneria spicata* x *Elymus lanceolatus*

☒

Ploidy  
Level:

- 1 = 2n=2x
- 2 = 2n=4x
- 3 = 2n=6x
- 4 = 2n=8x

2. ADAPTATION:

Geographical  
Regions:

Native to Asia  
Intermountain, Great Basin, Great Plains of North America

Land  
Resource  
Areas:

Arid to Semi Arid (200-350 mm annual Precipitation)

☒

USDA  
Plant Hardiness  
Zones:

4-6

- |       |       |       |         |
|-------|-------|-------|---------|
| 1 = 1 | 4 = 4 | 7 = 7 | 10 = 10 |
| 2 = 2 | 5 = 5 | 8 = 8 | 11 = 11 |
| 3 = 3 | 6 = 6 | 9 = 9 |         |

## 3. MATURITY:

9500075

☐ 2Relative  
Maturity:1 = Very Early  
2 = Early3 = Medium Early  
4 = Medium  
5 = Medium Late6 = Late  
7 = Very Late☐ 175

Days to Anthesis:

☐ ☐

Number of Days Earlier.

Name of Check Variety: \_\_\_\_\_

Same Number of Days.

Name of Check Variety: P-27☐ 05

Number of Days Later.

Name of Check Variety: Nordan

## 4. PLANT:

☐ 066

Plant Height in Centimeters (cm):

☐ ☐

Number of cm. Shorter.

Name of Check Variety: \_\_\_\_\_

Same Height.

Name of Check Variety: \_\_\_\_\_

☐ 01

Number of cm. Taller.

Name of Check Variety: P-27☐ 1

Growth Habit:

1 = Erect

2 = Semierect

3 = Prostrate

☐ 2

Rhizomes:

1 = Present

2 = Absent

☐ 1

Culm Pubescence:

1 = Glabrous

2 = Pubescent

3 = Partial

4 = Variable

☐ 2

Culm Glaucosity:

1 = Glaucous

2 = Non-glaucous

3 = Variable

## 5. LEAF:

☐ 4

Leaf Color:

1 = Blue-green

2 = Grey-green

3 = Dark Green

4 = Green

5 = Light Green

6 = Yellow-green

7 = Slate-green

8 = Other: \_\_\_\_\_

Leaf Color Reference Number: \_\_\_\_\_

☐ 1

Leaf Pubescence:

1 = Glabrous

2 = Pubescent

3 = Partial

4 = Variable

☐ 2

Leaf Glaucosity:

1 = Glaucous

2 = Non-glaucous

3 = Variable

☐ 1

Leaf Margin:

1 = Smooth

2 = Toothed

☐ 015

Leaf Length in centimeters.

☐ 01

Number of cm. Shorter.

Name of Check Variety: P-27

Same Length.

Name of Check Variety: \_\_\_\_\_

☐ ☐

Number of cm. Longer.

Name of Check Variety: \_\_\_\_\_

☐ 06

Leaf Width in millimeters.

☐ ☐

Number of mm. Narrower.

Name of Check Variety: \_\_\_\_\_

Same Width.

Name of Check Variety: P-27☐ ☐

Number of mm. Wider.

Name of Check Variety: \_\_\_\_\_

☐ 1

Sheath Auricles:

1 = Present

2 = Absent

☐ 1

Sheath Margins:

1 = Smooth

2 = Toothed

☐ 1

Sheath Ligule:

1 = Present

2 = Absent

## 6. SPIKE: (Please note the decimal point)

9500075

☒ 1

Spike Shape: 1 = Oblong 2 = Tapering 3 = Clavate 4 = Elliptical

☒ 1

Spike Orientation: 1 = Erect 2 = Semierect 3 = Drooping

☒ 1

Anther Color: 1 = Yellow 2 = Red 3 = White 4 = Green 5 = Purple 6 = Other = \_\_\_\_\_

☒ 1Glume Color: 1 = Green 2 = Grey-Green 3 = Yellow 4 = Tan 5 = Tawny 6 = Buff  
7 = Other = \_\_\_\_\_☒ 1 ☒ 0 ☒ 7

Spike Length in centimeters.

☒ 3

Spike Density: 1 = Lax 2 = Laxidense 3 = Dense

☒ 1

Glume Shape: 1 = Lanceolate 2 = Obovate 3 = Ovate

## 7. SEED: (Please note the decimal point)

☒ 0 ☒ 8

Glume Length in millimeters.

Glume Color: Brownish-yellow at Maturity☒ 0 ☒ 8 ☒ 5

Lemma Length in millimeters.

Glume Awn (descriptors): macronate to 4 mm☒ 0 ☒ 1 ☒ 1

Lemma Width in millimeters.

☒ 3

Lemma Pubescence: 1 = Pubescent 2 = Partial 3 = Glabrous

☒ 2Lemma Awn Size: 1 = Very Short 3 = Medium Short 6 = Long  
2 = Short 4 = Medium 7 = Very Long  
5 = Medium Long☒ 2 ☒ 5 ☒ 2 ☒ 5

Seed Weight in milligrams per 1000 seeds.

## 8. DISEASE AND PEST RESISTANCE: 1=Susceptible 2=Resistant 3=Tolerant 4=Avoidance 0=Not Tested

☒ 2Leaf Rust: *Uromyces dactylidis*☒ 2Stem Rust: *Puccinia graminis* ssp. *graminicola*☒ 2Stripe Rust: *Puccinia striiformis*☐

Other Disease(s): \_\_\_\_\_

☒ 4

Black Grass Bug:

☒ 2

Grass Billbug:

☒ 0

Pacific Grass Bug:

☐

Other Insect(s): \_\_\_\_\_

☒ 0

Nematode(s) (please specify as to species): \_\_\_\_\_

9. INTENDED USE: Please indicate All that Apply.☐

1 = Hay and Pasture

3 = Conservation Cover

5 = Silage/Green Manure

7. Saline/Alkaline Soil Stabilization

2 = Range Reseeding

4 = Erosion Control

6 = Wildlife Habitat Plantings

8. Other = \_\_\_\_\_

## 10. Comments:

## EXHIBIT C

## OBJECTIVE DESCRIPTION OF VARIETY

'Vavilov' Siberian Crested Wheatgrass  
*Agropyron fragile* (Roth) Candargy

Name of Applicant: K. H. Asay

Temporary Designation: Siberian crested wheatgrass .. Frag-Syn

Variety Name: Vavilov

PVPO Number:

1. SPECIES: *Agropyron fragile* (Roth) Candargy; also called *Agropyron sibiricum* (Willd.) Beauvois. Common name Siberian crested wheatgrass.
2. CYTOLOGY: Tetraploid ( $2n=28$ ) with the 'P' genome of the crested wheatgrass complex. Genome constitution = PPPP. The cultivar is fully fertile with regular meiosis.
3. ADAPTATION: Excellent drought resistance and adaptation to dry sandy soils. Vavilov is recommended for semiarid range sites receiving from 200 to 350 mm of precipitation annually at altitudes up to 2,100 m.
4. MATURITY: Early, similar to *Agropyron desertorum* and Siberian variety P-27
5. PLANT HEIGHT: 66 cm
6. GROWTH HABIT: Erect
7. RHIZOMES: Caespitose (bunch type) with no rhizomes
8. LEAF BLADE:

Color - Green

Glaucosity - Glabrous

Anthocyanin - Generally absent in mature plants

Margins - Smooth

Length - 14 to 16 cm

Width - 5 to 7 mm

9. LEAF SHEATH:

Auricles - Present  
Margins - Smooth  
Ligule - Present

10. INFLORESCENCE (SPIKE TYPE):

Shape - Linear, lanceolate, imbricate, comb like; longer and more narrow than *A. desertorum* or *A. cristatum*.  
Orientation - Erect  
Anther Color - Yellow  
Glume Color - Green  
Spike Length -  $10.7 \pm 1.5$  mm

11. LEMMA:

Length -  $8.5 \pm 1.9$  mm  
Width -  $1.1 \pm 0.1$  mm  
Awn Length - (Awnless to awn tipped - Avg = 1.1 mm)

12. SEED:

2,525 mg/1000 seeds

13. DISEASE, INSECT, AND NEMATODE REACTION:

Good resistance to diseases and insects found on semiarid rangelands

14. VARIETIES MOST CLOSELY RESEMBLING APPLICATION VARIETY:

P-27, a variety released in 1953 by the USDA-SCS and Idaho AES. P-27 is the only other variety of Siberian crested wheatgrass to be released.

**Table 1. Variation among crested wheatgrass cultivars for several morphological traits at the Utah Agricultural Experiment Station, central Utah. Annual precipitation = 325 mm. Experimental design = randomized complete block with four replications of five-plant plots on 1 m centers.**

Character	Variety						LSD <sup>1</sup>
	Vavilov		P-27		Nordan		
	Mean	SD	Mean	SD	Mean	SD	
Plant height (cm)	65.7	5.5	64.5	4.9	61.8	5.6	ns
Leaf length (cm)	15.0	4.8	16.1	3.3	13.0	3.7	ns
Leaf width (mm)	5.8	0.9	6.1	1.1	7.7	2.4	1.3
Spike length (cm)	10.7	1.5	10.4	2.0	5.9	0.8	1.3
Spike width (mm)	9.1	2.5	8.1	1.3	13.0	2.9	2.0
Number of spike nodes	43.3	6.4	44.6	6.0	56.8	8.2	5.7
Spikelet length (mm)	10.4	2.0	11.1	1.4	7.5	1.6	1.4
Spikelet width (mm)	4.7	1.1	4.3	0.6	3.7	0.6	0.7
First glume length (mm)	8.0	1.6	6.5	1.0	5.3	1.3	1.1
Width (mm)	1.0	0.2	1.1	0.1	0.6	0.2	0.2
Awn length (mm)	3.1	1.5	2.2	0.7	2.0	0.8	0.9
Second glume length (mm)	8.1	1.7	6.6	1.1	5.6	0.9	1.1
Width (mm)	1.0	0.2	1.1	0.2	0.8	0.3	0.2
Awn length (mm)	2.9	1.6	1.8	1.1	2.2	0.7	ns
First lemma length (mm)	8.5	1.9	7.0	1.0	7.4	0.9	1.1
Width (mm)	1.1	0.1	1.2	0.2	0.9	0.1	0.1
Awn length (mm)	1.3	1.1	0.7	0.8	2.2	0.6	0.8
Palea length (mm)	6.1	1.0	5.6	0.3	4.5	0.6	0.6

1/ LSD (0.05), SD = Standard deviation.

**Table 2. Stand establishment vigor and forage yield of seven varieties and one experimental line on dry/arid sandy site near Stone, Idaho. Average annual precipitation = 280 mm. Experimental design was a randomized complete block with 4 replications of seeded plots.**

	Stand Rating <sup>1</sup>				Dry Matter Yield (kg/plot)		
	Year-1	Year-2	Year-3	Year-4	Year-3	Year-4	Mean
Vavilov	7.5	8.0	8.5	8.3	0.30	1.19	0.74
P-27	2.3	2.5	2.5	5.5	0.16	0.88	0.52
Douglas	5.5	6.0	5.5	5.5	0.13	0.69	0.41
Ephraim	3.3	4.0	4.3	7.0	0.13	1.01	0.57
Fairway	5.8	6.5	6.8	7.8	0.16	0.88	0.52
Hycrest	7.8	8.0	8.0	9.0	0.33	1.30	0.82
Nordan	6.0	7.0	6.8	5.0	0.22	1.05	0.58
Exp-BL	5.3	6.3	5.5	5.5	0.19	0.88	0.53
LSD (0.05)	1.4	1.2	1.1	1.5	0.04	0.28	0.14

1/ Stand ratings were made on 1 to 9 scale, 1 = worst and 9 = best stand, and each value represents an average of 4 replications.

**Table 3. Stand-establishment vigor and dry matter yield of crested wheatgrass varieties on favorable<sup>1</sup> semiarid site at Utah State University Blue Creek Experiment Station. Average annual precipitation = 360 mm. Experimental design was a randomized complete block with four replications of seeded plots.**

	Stand Rating <sup>2</sup>				Dry Matter Yield (kg/plot)		
	Year-1	Year-2	Year-3	Year-4	Year-2	Year-4	Mean
Vavilov	7.0	7.3	7.5	8.0	1.87	1.86	1.86
P-27	6.3	5.8	6.5	7.0	1.91	1.84	1.87
Douglas	5.8	5.5	6.0	6.8	1.30	1.67	1.49
Ephraim	7.0	8.3	8.3	8.0	1.95	1.75	1.85
Fairway	6.0	8.0	7.5	7.8	2.07	1.61	1.84
Hycrest	8.5	8.8	8.3	8.8	2.61	2.12	2.36
Nordan	5.5	7.3	7.3	8.5	2.36	2.00	2.18
LSD (0.05)	1.1	0.6	0.9	0.6	0.45	0.25	0.32

1/ This site is more optimum (less drought and better soil) than Stone, ID site in Table 1.

2/ Stand ratings were made on 1 to 9 scale, 1 = worst and 9 = best stand.



**Table 4. Stand-stablishment vigor and dry matter yield of four varieties and one experimental line on a rocky, severe west-facing slope near Logan, UT. Experimental design was randomized complete block with four replications of seeded plots.**

	Percent Stand			Dry Matter Yield (kg/plot)					
	Year-1	Year-2	Year-6	Year-2	Year-3	Year-4	Year-5	Year-6	Mean
Vavilov	85	83	80	1.42	1.07	0.61	0.51	0.44	0.81
P-27	21	43	40	0.85	0.66	0.54	0.42	0.36	0.57
Hycrest	73	80	60	1.38	0.98	0.58	0.45	0.36	0.75
Nordan	48	59	50	1.11	0.81	0.59	0.38	0.36	0.65
Exp-BL <sup>1</sup>	94	91	60	1.32	0.87	0.48	0.43	0.28	0.68
LSD (0.05)	14	10	11	0.43	0.22	0.13	0.12	0.09	0.15

**Table 5. Stand and dry matter yield of crested wheatgrass varieties on semiarid site in central Wyoming. Annual precipitation = 275 mm. Experimental design = randomized complete block with four replications.**

Entry	Stand Rating (1-9) <sup>1/</sup>		Dry Matter Yield (g/plot)		
	Year-1	Year-2	Year-2	Year-4	Mean
Vavilov	8.5	7.5	374	757	566
P-27	5.3	6.3	322	708	515
Hycrest	7.5	8.3	414	610	512
Nordan	6.0	7.8	414	672	544
Douglas	6.0	6.8	193	381	287
LSD (0.05)	2.6	1.0	82	177	109

**1/ Stand ratings are on 1 to 9 basis, 1 = worst and 9 = best stand.**

**Table 6. Forage yield (kg green wt/plot), seed yield (g/plot) and mg/1000 seeds of three varieties and one strain of Siberian crested wheatgrass grown as spaced plants at the Utah Agricultural Experiment Station, central Utah. Annual precipitation = 325 mm. Experimental design was a randomized complete block with four replications of five-plant plots on 1 m centers.**

	Two-year Means		
	Forage Yield	Seed Yield	mg/1000 Seeds
Vavilov	3.16	151.2	2525
P_27	2.66	152.7	2025
Nordan	2.61	64.2	1388
Kazak Acc	1.44	85.2	2298
LSD (0.05)	0.42	44.2	272

1/ Data collected for two after one year of stand establishment.

THE  
UNITED STATES DEPARTMENT OF AGRICULTURE  
AGRICULTURAL RESEARCH SERVICE

AND

UTAH AGRICULTURAL EXPERIMENT STATION  
UTAH STATE UNIVERSITY  
LOGAN, UTAH

AND

UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

ANNOUNCE THE RELEASE OF

VAVILOV SIBERIAN CRESTED WHEATGRASS

VAVILOV Siberian crested wheatgrass [*Agropyron fragile* (Roth) Candargy] was named to acknowledge the contribution of the N.I. Vavilov Research Institute of Plant Industry, St. Petersburg, Russia (VIR) to the germplasm resources of the USDA-ARS range grass breeding program. This institute is celebrating its 100th anniversary in 1994. The parental germplasm for cultivar VAVILOV was derived from accessions originally received from VIR; Stavropol Botanical Garden, Stavropol, Russia; Eskisehir Plant Breeding Station, Eskisehir, Turkey; and selections from the cultivar P-27. The parental accessions were originally selected on the basis of green-color retention and vegetative vigor during the late summer under extreme drought conditions on a range site in Box Elder County, Utah. During the development of the cultivar, the breeding population was screened for three cycles for vegetative vigor; response to drought, diseases and insects; seedling vigor; seed yield; and plant type. Open-pollinated progenies from 14 selected clonal lines in the third breeding cycle were bulked to form Breeder seed.

Seedling vigor of VAVILOV, as indicated by establishment in field trials and seedling emergence from deep seedings, is comparable to the cultivar Hycrest and is consistently better than the check cultivar P-27. It has produced significantly more forage dry matter than P-27 in most evaluation trials. Limited data indicate slightly lower digestibility (IVDMD) than P-27; however, levels of Mg, Ca, and K in the forage indicate that it is less likely to cause grass tetany in grazing animals than P-27. The cultivar produced 450 kilograms of seed per hectare (400 pounds/acre) when grown in rows 1 meter apart on a dryland site that received 35 centimeters (14 inches) of annual precipitation. Supplemental irrigation would increase seed yields about 50 percent. At 100 percent purity, there are approximately 330,000 seeds per kilogram (150,000 seeds per pound).

VAVILOV is a tetraploid ( $2n=28$ ) and is fully interfertile with cultivars of Standard crested wheatgrass [*Agropyron desertorum* (Fisch. ex Link) Schultes] as well as the cultivar Hycrest. Cytological studies show that Siberian crested wheatgrass shares the same genome ('P') with other diploid ( $2n=14$ ), tetraploid, and hexaploid ( $2n=42$ ) forms of the crested wheatgrass complex. Siberian wheatgrass is a perennial bunch grass characterized by linear, narrow, and relatively long spikes. Genetic introgression occurs between the Siberian and Standard forms in nature, and a gradation between the long-narrow

spike of Siberian and the shorter and wider spike of Standard is evident in the VAVILOV breeding population.

In its native habitat, the Siberian form of crested wheatgrass is more drought-resistant than either Standard or Fairway [*Agropyron cristatum* (L.) Gaertner s. lat.] and is better adapted to sandy soils than other crested wheatgrass types. The cultivar VAVILOV is recommended for semiarid range sites receiving from 20 to 45 centimeters (8 to 18 inches) of precipitation annually at altitudes up to 2,100 meters (7,000 feet). When drilled under dryland range conditions, a seeding rate of 8 kilograms per hectare (7 pounds per acre) is recommended.

Breeder, Foundation, and Certified seed classes will be recognized. Breeder seed will be maintained by the USDA-ARS Forage and Range Research Laboratory at Logan, UT. Foundation seed will be produced by the USDA-ARS at Logan and distributed to seed growers by the Utah Crop Improvement Association. Protection has been applied for under the Plant Variety Protection Act of 1970. Conditions of this license specify that seed of the cultivar VAVILOV can be marketed only as a class of certified seed. For information regarding supplies of foundation seed, contact:

Stanford Young  
Utah Crop Improvement Association  
Plants, Soils, and Biometeorology Department  
Utah State University  
Logan, UT 84322-4820  
(801) 797 2082

Release date for publicity purposes shall be effective on the date of the final signature on the release notice.

#### APPROVAL SIGNATURES:

JUL 01 1994

Date

Howard J. Brack  
Administrator  
for Agricultural Research Service,  
U. S. Department of Agriculture

May 24, 1994

Date

[Signature]  
Director  
Utah Agricultural Experiment Station

June 23, 1994

Date

[Signature]  
Chief  
Soil Conservation Service  
U. S. Department of Agriculture

## EXHIBIT E

## BASIS OF APPLICANT'S OWNERSHIP

'Vavilov' Siberian crested wheatgrass was originated and developed by employees of the Agricultural Service of the United States Department of Agriculture (USDA-ARS). By agreement between employees and the USDA-ARS, all rights to this variety are retained by USDA-ARS.

U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

EXHIBIT E  
STATEMENT OF THE BASIS OF OWNERSHIP

1. NAME OF APPLICANT(S) USDA-ARS UTAH AGRICULTURAL EXP. STATION USDA-NRGS	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER  FRAGILE SYN	3. VARIETY NAME  VAVILOV
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country) USDA-ARS, FRRL UTAH STATE UNIVERSITY LOGAN, UT 84322-6300	5. TELEPHONE (include area code) (801)797-3069  7. PVPO NUMBER 9500075	6. FAX (include area code) (801)797-3075

8. Does the applicant own all rights to the variety? Mark an "X" in appropriate block. If no, please explain. ☒ YES ☐ NO

9. Is the applicant (individual or company) a U.S. national or U.S. based company? If no, give name of country U.S. Government Agencies ☒ YES ☐ NO

10. Is the applicant the original owner? ☒ YES ☐ NO If no, please answer the following:

a. If original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. national(s)?

☐ YES ☐ NO If no, give name of country

b. If original rights to variety were owned by a company, is the original owner(s) a U.S. based company?

☐ YES ☐ NO If no, give name of country

11. Additional explanation on ownership (If needed, use reverse for extra space):

## PLEASE NOTE:

Plant variety protection can be afforded only to owners (not licensees) who meet one of the following criteria:

- If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
- If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
- If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definition.

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, and marital or familial status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (braille, large print, audiotope, etc.) should contact the USDA Office of Communications at (202) 720-5881 (voice) or (202) 720-7808 (TDD).

To file a complaint, write the Secretary of Agriculture, U.S. Department of Agriculture, Washington, D.C. 20250, or call 1-800-245-6340 (voice) or (202) 720-1127 (TDD). USDA is an equal employment opportunity employer.